

## DEVELOPMENT ROLE PLAYING GAME OF COLLISION THEORY FOR LEARNING MEDIA IN SUB TOPIC FACTORS AFFECTING THE REACTION RATE FOR XI GRADE SENIOR HIGH SCHOOL

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### Abstrak

Penelitian dan pengembangan ini bertujuan untuk mengetahui kelayakan permainan *Role Playing of Collision Theory* yang dikembangkan sebagai media pembelajaran pada Pada Sub Pokok Faktor-faktor yang Mempengaruhi Laju Reaksi yang ditinjau dari validasi, efektivitas dan kepraktisan permainan. Jenis penelitian ini termasuk penelitian pengembangan (R&D) yang terdiri dari tahap analisis, rancangan produk, pengembangan, dan evaluasi. yang meliputi uji coba produk, revisi I, uji coba pemakaian, revisi II, dan produksi massal. Pada tahap evaluasi dalam penelitian ini, hanya dibatasi hingga kegiatan uji coba produk untuk mendapatkan data efektivitas permainan yang meliputi hasil belajar dan aktivitas siswa serta data kepraktisan permainan yang berupa angket respon siswa. Permainan telah divalidasi serta diujicobakan pada siswa kelas XI SMA Widya Darma Surabaya. Hasil penelitian menunjukkan bahwa permainan *Role Playing of Collision Theory* yang dikembangkan pada Pada Sub Pokok materi Faktor-faktor yang Mempengaruhi Laju Reaksi layak digunakan sebagai media pembelajaran yang ditinjau dari hasil validasi 82,92%, keefektifanyang meliputi: ketuntasan klasikal 82,35%, aktivitas siswa 85,88%, dan kepraktisan permainan 94,65%.

**Kata Kunci:** Permainan *Role Playing of Collision Theory*, faktor-faktor yang mempengaruhi laju reaksi.

### Abstract

The aims of this development research are to know the feasibility of *Role Playing of the Collision Theory Game*, which was developed as learning media in sub topic Factors Affecting the reaction rate in terms of validation, effectiveness and practicality of the game. The type of this research is research and development (R & D) which comprises of steps: analysis, design, development, and evaluation consist of product trials, revision I, implementation test, revision II, and publication. In evaluation step limited to the activities of product trials to obtain game effectiveness data that consist of student learning outcomes, and student activities then data of game practicality in the form of student questionnaire responses. The game has been validated and test in XI Grade Senior High School of Widya Dharma Surabaya. The results showed that the *Role Playing of Collision Theory Game* in sub topic Factors Affecting the Reaction Rate feasible for use as learning media in terms of result validation 82,92%, the effectiveness consist of classical completeness 82,35% and student activities 85,88%, and game practicality 94,65%.

**Keywords:** *Role Playing of Collision Theory Game*, Factors that affecting reaction rate..

## INTRODUCTION

Active learning, experimental, and student-centered is learning that engages students physically and intellectually so that students are able to express themselves about what they feel (Joyce and Weil, 2009) [1]. Student-centered learning in science, should be fun and not just the aspect of knowledge, but also aspects of skills and attitudes, such as their feelings and emotions. Fun means students are involved with activities that motivate them to learn then students do not feel tired and bored in learning process. Therefore, teachers need to design and then create media that can achieve this goal.

Learning Media is an intermediary or introductory information of the sender in this case is the teacher to the students as recipients of information (Sadiman, 2012) [2]. The media can act as a tool to carry out communication in teaching and learning interaction, the media can be object, people, or phenomena that give certain conditions for students then enable to acquire certain knowledge (Heinich, 1999) [3]. According to (Mulyanta and Leong, 2009) criteria for good learning media consist of: (1) correlation or relevance, (2) easiness, (3) attractiveness, and (4) advantages [4]. Learning media can be a tool, technology, objects around, models, strategies and even activities like games. Chemistry learning media is media that mediates chemical information from the teacher to the student. Relate to Sadiman (2012) advantages of learning media consist of: (1) advance student learning passion, and (2) creates a perception of the same concept [2].

One of learning media is media in the form of the game. The game is learning media in which the players in this case are the students interact with each other to follow certain rules to achieve certain goals (Musfiqon, 2012) [5]. According to (Sadiman, 2012) every game should have

main components, consist of: (1) the presence of the player, (2) rules of the game, and (3) specific objectives to be achieved [2]. Through games students understand the rules that apply in the game and must be adhered to, so children also learn about a system of values and morals. Therefore, play became a central activity that is very important for students.

The game should be qualified in educational, technical, and aesthetic requirements in order to be considered as a learning media (Badru, 2009) [6]. Game that is used as learning media in classroom can make students excited in the learning process because the class is fun, according to (Dryden and Vos, 2004), the learning process be more effective when a person is in a state of pleasant [7]. Effective learning is a learning that allows students to learn specific skills, knowledge and attitudes that make students delight (Sutikno, 2007) [8]. Learning will be more effective if done in a fun situation, it is necessary to create a conducive learning, in addition to other factors that will determine the outcome of student learning by playing (Angkowo, 2007) [9].

Some of these opinions showed learning is more effective when students are in fun situation, things that can make fun situation in learning process is using game as learning media. One of game that can improve student learning outcomes and make students excited in learning process is role playing game. The game can motivate students to learn and improve the level of student understanding (Freitas, 2006) [10]. Role playing allows to create original and the same analogy with real life issues and through repetition, students can understand and contemplate the 'sample' of life (McSharry and Jones, 2000) [11].

Role Playing Game is learning media in the form of a game in which students act as a certain person or object conducting characterization based on the characteristics of what is played to achieve

the learning objectives [11]. In science, such as chemistry, often used analogy role-play that engage student to role as science objects such as atomic structure, gas laws, and collision theory in reaction rate [11]. The main thing on the analogy is to connect something that is unknown by students (unfamiliar) with something that is known to them (familiar) so students learn in constructivist learning from their initial knowledge to acquire new knowledge (Lyoyd, 1998) [12]. Role playing game provides some advantages in learning. Poorman (2002) mentioned the advantages, such as: (1) the interest of students to the matter increases, (2) increase the involvement of students in the classroom. (3) teach students empathy and understand different points of others view [13]. Role playing game also increase student understanding and are able to develop student's ability to control themselves in the classroom.

The results of a survey conducted on XI Grade Senior High School Widya Dharma Surabaya by questionnaire that contain questions to determine student attractive regarding the use of the game as a learning media. In the questionnaire known to 52.63% of students stated Factors Affecting Reaction rate is a difficult matter, 84.7% of students stated lecture method is a method that is always used by teachers to explain matter, and 100% of students stated bored with learning methods that commonly applied by teacher. An attempt to overcome these difficulties is required media that is easy to understand by students for learn factors that affect reaction rate matter. Teachers need a media that can convey information about abstract objects in chemistry and students also need the media as a fun learning game without loose of learning activities in the classroom. Based on the opinions above, the purpose of this reserach is to determine the feasibility of Role Playing Game as learning media in

sub topic Factors Affecting Reaction Rate in terms of: (1) validation, (2) effectiveness, and (3) practicality of the game.

## METHODS

The method used in this research is Research and Development (R & D). The steps of research are four steps: (1) analysis, (2) design, (3) development, and (4) evaluation (Akker, 2006) [14]. The details of the research procedure can be seen in the following diagram:

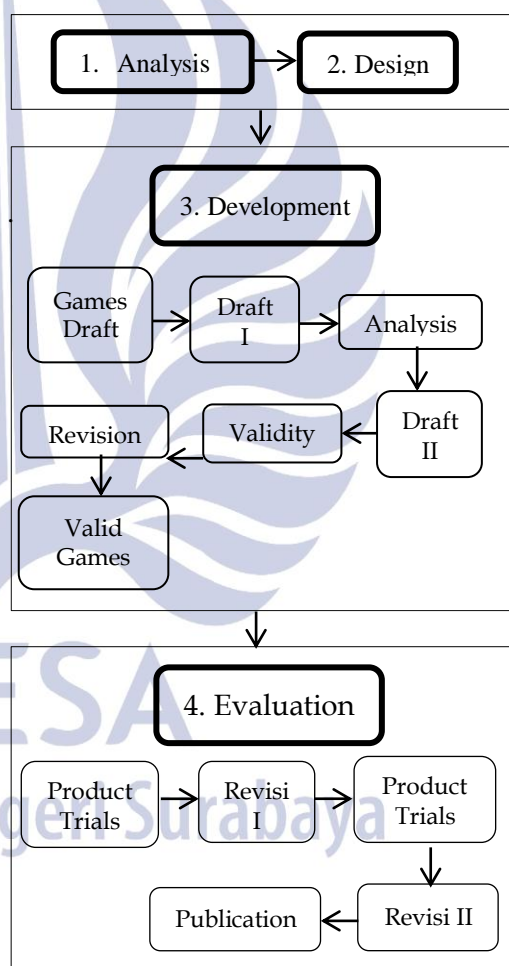


Diagram 1. The steps of Reseach and Development (R&D, modified from Akker, 2006) [14].

Steps analysis includes literature analysis, and analysis area. Literature analysis is a study to learn the concepts or theories relating the procedure to select product. Relate to Piaget's theory of evolution, learning involves all the senses, save longer impression and cause a sensation that made an impression on the students (Hangerhan and Olson, 2009) [14]. Play can be said learning that involves all the senses because when playing students use parts of body to move and follow the game, so that learning is accompanied by the game easier to understand and remember for students. To support the selection of appropriate media and in accordance with the student learning outcomes is then performed analysis area. Analysis area do by giving a survey to students, the survey contains questions of media relate their lessons. Based on the results of the survey, then conclude learning media that teachers commonly implement make students bored in learning process so the motivation and enthusiasm of students in learning impact on learning outcomes are unsatisfactory.

The result from analysis literature and analysis area, then made Role Playing game as learning media in sub topic Factors Affecting reaction rate that can make students' enthusiasm in the learning process that will improve student learning outcomes. The third step is development, began by drafting the game (first draft of game) that will be develop, after draft I made, analys the draft by experts on the matter and media. The next step is the first revision that produced draft II, which would be validated by media and matter expert in terms of the suitability of matter, the requirements of the game, the game presentation and the language used to produce a game that is otherwise valid.

The last step is evaluation such as: trials product, revision I, implementaion test, revision II, and publication. Evaluation step is limited to trials product activities.

The effectiveness of data such as student learning outcomes in terms of the results pretest and posttest, questionnaire observation of students activities, and the practicality of data in the form of student questionnaire responses that contains some question relate to rules of playing, the attractiveness of game presentation, the language used, students involve in learning with the games, and the ease of use the Role Playing game as a learning media.

The result of validation instruments in the form of questionnaire validation calculated using the formula:

$$P(\%) = \frac{\text{Total Score}}{\text{Criteria Score}} \times 100\%$$

Criteria Score = The highest score in item  
 $\times \sum \text{item} \times \sum \text{validator}$

The game is declared valid if the validity of game percentage results reached  $\geq 61\%$  (Riduwan, 2012) [16].

The effectiveness of the instruments data obtained:

1) Student learning outcomes  
Calculated using the formula:

$$\text{Scores} = \frac{\text{Total Score Reached}}{\text{Total Score Maximum}} \times 4$$

Students are said to be complete if the minimum score obtained reaches interval values from 2.51 to 2.84 with the predicate B-.

Classical completeness is calculated using the formula:

$$P(\%) = \frac{\text{The number of students who completed}}{\text{Number of Student}} \times 100\%$$

The game is declared effective if percentage results of classical completeness reached  $\geq 61\%$  (Riduwan, 2012) [16].

2) The result student activities

Student activity observation data obtained by giving a score based on Gutman scale (Arikunto, 2002) [17], as shown in table 1:

Tabel 1 Gutman's Scale

Criteria	Score
Yes	1
No	0

Results of student activity is calculated using the formula:

Score Criteria =  $\frac{\text{The highest score in item} \times \sum \text{item} \times \sum \text{responden}}{\text{Total Score}}$

$$P (\%) = \frac{\text{Total Score}}{\text{Score Criteria}} \times 100\%$$

The game is declared effective if the percentage of students activity results reached  $\geq 61\%$  (Riduwan, 2012) [16].

Practical instrument in the form of student questionnaire responses obtained by giving a score based on a Gutman's scale as in table 1. Results of student activity calculate the by using the formula:

Score Criteria =  $\frac{\text{The highest score in item} \times \sum \text{item} \times \sum \text{responden}}{\text{Total Score}}$

$$P (\%) = \frac{\text{Total Score}}{\text{Criteria Score}} \times 100\%$$

The game is said to be practical if the percentage of students response results reached  $\geq 61\%$  (Riduwan, 2012) [16].

## RESULT AND DISCUSSION

The results of game validity in terms of suitability matter, the game requirements, presentation, and the language used is shown on table 2.

Table 2 Result of Games Validity

Criteria	Score (%)	Category
Matter Suitability	82,22	Very valid
Games Requirement	82,22	Very valid
Presentation game	82,66	Very valid
The Language used	86,97	Very valid
<b>The total value</b>	<b>82,92</b>	<b>Very valid</b>

Table 2 shows that Role Playing game is valid to use as learning media. Supported by (Mulyanta and Leong, 2009) which states that the criteria of good learning media includes 4 main issues suitability or relevance, Ease, the attractiveness [4] and (Badru, 2009) games is learning media if it complete the educational, technical and aesthetic requirements [6]. In this case the educational requirements in the form of material suitability, game requirements, and aesthetic requirements of the presentation indicated the game was complete with a value that has been obtained. Based on the statement above can be seen that role playing game can be used as learning media, because completed the criteria of learning media. The next step is game trial. In these activities will produce effectiveness data such as:

### 1) Student learning outcomes

Student learning outcomes showed that after learn by Role Playing game student classical completeness in pretest is 47,05% with effective enough category, the in posttest increase to 82.35% with very effective category. This indicates Role Playing game effectively used as learning

media. This is supported by a research (Freitas, 2006) game can motivate students to learn and improve the level of understanding [11]. According poorman (2002), role-playing game provides several advantages, such as: student interest to the matter is increases, as evidenced by the increase in student learning outcomes [14]. According to (Angkowo, 2007) learning will be more effective if done in a pleasant condition [10], it is necessary to create a conducive learning, in addition to other factors that will determine the outcome of student learning by playing, it indicates that the game makes student fun during learning process that improve student learning outcomes. According to (Sadiman, 2012) which states instructional media is an intermediary or introductory information of the sender in this case is the teacher to the students as recipients of information [2], an increase in student learning outcomes after play Role Playing game shows that the game is a good introductory information from the teacher to the student in the learning process. So, based on student learning outcomes and some of the statements, role playing game effective as learning media. From all statements, above can be seen that role playing game can be used as learning media, because it can improve student learning outcomes.

2) The result of student activities

Student activities acquire 85.55% results categorized as very effective. This shows that students are very attractive and excited when learning use role playing game so that games developed effectively used as learning media. This is supported by the statement Sadiman (2012) the advantage of media is increased the result of student understanding [2], which is indicated by the high activity of students during learning with role playing game.

Student activity during learning with role playing game has qualified in educational game media according to

(Badru, 2009) game that is made can help encourage student activity [7]. Thus, based on the observation of student activity and some of the statements, role playing game effectively used as a learning media because it can increase the activity of students in the learning process.

In addition to practicality data, in the form of the results of student questionnaire responses, the result are shown in Table 3.

Tabel 3 The results of student responses

Criteria	Responses (%)	Category
Clarity the rule of game	96,07	Very Practical
Presentation of the attractiveness game	88,23	Very Practical
Use of Language In Games	100	Very Practical
The game can increase the enthusiasm in learning	100	Very Practical
Ease of the game use	92,15	Very Practical
<b>Total responses</b>	<b>94,65</b>	<b>Very Practical</b>

Based on table 3 students' response to role playing game are excellent. This is supported by the requisite of great game (Badru, 2009) learning media should be easy to use, and adds to the pleasure of students to experiment and explore [7]. According to poorman (2002), role playing game increases student interest of the matter [14], and supported by a research from Freitas (2006) which states the game can motivate students and increase student comprehension levels [11]. According Mulyanta and Leong (2009) all the learning content through the media should be to studied or understood by students [4]. So based on the data of student questionnaire responses and some of the statements above role playing game can be

used as a learning media in terms of practicality game.

## CLOSURE

### Conclusion

Role playing game feasible to use as learning media in sub topic Factors Affecting the Reaction Rate, that it proved by the result of: (1) game validity 82,92%, (2) game effectiveness, such as: classical completeness 82,35%, student activity 85,88%, and (3) game practicality in form of student questionnaire responses 94,65%.

### Suggestion

Based on the conclusions that have been made, researcher propose suggestions or recommendations as follows:

1. In implement this game, it necessary if teacher preapre the sound that will support the game, then if speaker in the school unplugged, music can turn by teacher's speaker.
2. The response of this development reasearch is awesome, so role playing game should develop in others matter that can make student attract to learn.

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